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FUNCTIONAL CHARACTERISTICS

RT-21

JULY 1958

DES	8	REV DATE	10 APR 1959	BY	018313
ORIG COMP	33	OPI	56	TYPE	30
ORIG CLASS	5	PAGES	5	REV CLASS	C
JUST	22	NEXT REV	2010	AUTH:	MR 70-2

CONCURRENCES:

Chief, Engineering Division \_\_\_\_\_

Chief, Operations & Training Division \_\_\_\_\_

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## FUNCTIONAL CHARACTERISTICS

RT-21

### I. GENERAL INFORMATION

#### 1. Introduction

In order to maintain leadership in the [ ] field, it is mandatory that equipment development be initiated as soon as warranted by state of the art advances made in circuit and component development. Such advances now indicate the feasibility of designing a "state of the art" [ ] superior to any unit now in existence or known to be under development by the U. S. Government. This proposed transmitter is designated the RT-21 [ ]

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#### 2. Objective

Design objectives of the RT-21 [ ] development include:

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- 1) ultra-miniaturization to provide minimum weight and size
- 2) improved ruggedness for high field reliability
- 3) a completely waterproof package
- 4) semi-automatic tuning for simplicity of operation

The sophisticated push-button design of the RT-21 will provide high operator reliability when used by personnel with no formal radio training. Familiarization with communication techniques and in the operation of accessory equipment such as receivers and semi-automatic keyers would, of course, be required.

#### 3. Proposed Service Employment

A. The RT-21 [ ] shall have a nominal power output of ten watts for [ ].

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B. The transmitter shall be utilized for [ ]

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C. Power requirements shall be 12 volts DC to be provided by a battery and or an accessory AC power supply.

D. The equipment size, weight and shape shall [ ]

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[ ] The maximum volume shall not exceed 27 cubic inches with the approximate dimension of 6" x 3" x 1.5" and shall not weigh over two pounds.

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E. The RT-21 is new equipment suitable as a companion unit for the RR/D-11 communications receiver. These units would ultimately replace the RS-5, RS-6 and RS-11 series radio stations.

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4. Functional Requirements

- a. The functional requirements of the RT-21 are a high degree of miniaturization, power supply efficiency, extreme ruggedness and component reliability. It shall be mandatory that this equipment be free of spurious, transient, and harmonic radiation to the maximum degree possible within the state of the art.
- b. A self-contained key shall be incorporated for Morse code transmissions at manual speeds.
- c. An external keying provision shall be made for keying with accessory automatic keyers at speeds up to 300 wpm.
- d. The maximum operating range with high speed keying will necessarily be less than that obtainable with slow speed keying due to increased bandwidth requirements and resultant reduction in receiver signal to noise ratio.

5. Background and/or Related Information

- a. For battery operation, the RS-11 equipment is dependent on the BA-1315/U mercury battery which was selected on the basis of world-wide availability. Mercury batteries are noted for their high ratio of watt-hour capacity to size, but their characteristic performance at reduced temperatures is considerably inferior to that of other battery types, especially with the high drain required by transmitter operation. It is clear therefore, that mercury batteries are not satisfactory for powering a general purpose [redacted] A possible solution to the battery problem is to provide high B+ voltages from a DC-to-DC converter powered by a 12 VDC source. This low voltage source may be a LeClanche, lead acid, or nickel cadmium battery, any of which exhibits better low temperature characteristics than do Mercury cells. A DC-to-DC converter has the additional capability of furnishing a bias voltage, to permit, in many cases, more efficient operation.

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## II. OPERATIONAL CHARACTERISTICS

1. Frequency Coverage

The frequency coverage of the RT-21 shall be from 3 to 30 megacycles.

2. Emission Designation

The RT-21 shall be normally used for A-1 operation.

3. Keying

- a. It shall be possible to key the RT-21 at speeds of up to 25 wpm (Morse) using a self-contained telegraph key.
- b. The RT-21 shall be capable of keying speeds of up to 300 wpm with accessory keying equipment.

4. Power Output

- a. Radiated power output of the RT-21 shall be approximately 10 watts.
- b. A fully transistorized transmitter is desired for equipment reliability.

5. Interference Elimination

- a. The RT-21 transmitter shall incorporate maximum provisions for eliminating conducted and radiated interference.
- b. Filters or other special circuitry shall be provided for minimum harmonic radiation, particularly within the TV bands.
- c. Special shielding shall be provided to reduce radiation from the oscillator and DC-to-DC converter.
- d. Key click radiation will be held to a minimum.

6. VFO Operation

Provisions shall be made to operate the RT-21 with  now under development.

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7. Stability

The stability of the transmitter shall be determined by the crystal or VFO which determines its frequency.

8. Special Features

- a. The RT-21 will use an untuned transistor oscillator to simplify the tuning procedure; tank tuning and antenna loading shall be semi-automatic, and, as presently envisioned, accomplished with a servo-motor system. A "press-to-tune" control would activate the servo motor system and tune the tank and antenna coupling network.

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- b. This represents the first attempt to utilize miniature servo-motors for semi-automatic tuning of the Power Amplifier and Antenna Loading circuits [redacted] In the event that this method is found to be unreliable, it will be discarded in favor of a conventional tuning system using a minimum number of controls for proper tuning and loading of the RT-21 Transmitter.

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### III. PHYSICAL CHARACTERISTICS

#### 1. Weight and Size

- a. Weight of the complete transmitter, less Power Supply, shall not exceed two pounds, and the volume shall not be over 27 cubic inches. The approximate dimensions shall be 4" long x 3" wide x 1.5" in depth. A maximum effort will be made to reduce further the weight and size of the transmitter and accessory power supply.
- b. The RT-21 Transmitter anticipates the use of such components as ultra-miniaturized servo motors, Teflon or barium titanate dielectric tuning capacitors and transistor power amplifiers. Such components will contribute to an engineering design miniaturization not heretofore possible. The exact degree of weight and size reduction cannot be presently determined.
- c. The AC Power Supply shall be designed for maximum miniaturization within the "state of the art", and so that satisfactory operation may be obtained when utilizing power with a frequency range of 50 to 60 cycles and with an input of 70 to 270 volts AC. The output voltage supplied by this power supply will be 12 volts DC.
- d. The DC to DC Converter will be designed, as part of the transmitter.

### IV. EQUIPMENT OPERATION AND MAINTENANCE CHARACTERISTICS

#### 1. Operating Time

The components utilized in the design of the RT-21 Transmitter shall provide for maximum reliability and shall be capable of continuous operation with a nominal 50% CW duty cycle.

#### 2. Personnel Considerations

Installation and operation of the equipment shall [redacted]

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#### 3. Maintenance

- a. No provision for maintenance by operating personnel will be made.
- b. [redacted] maintenance with standard test equipment shall be feasible.

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